TABLE 18.—Trends in smoking initiation, NHISs, United States, 1965–87

	Smoking prevalence (%), ages 20–24								
						Education level			
		Sex		Race		High school graduate or less		Some college or more	
Year	Overall population	Males	Females	Whites	Blacks	Males	Females	Males	Females
1965	47.8	56.3	40.5	47.5	50.8	63.6	42.6	42.7	34.5
1966	47.7	57.7	39.5	48.2	45.5	65.1	41.3	43.5	34.7
1970	41.5	48.5	35.8	41.2	45.2	60.0	40.2	33.2	26.8
1974	39.5	44.3	35.4	38.6	47.1	52.7	40.1	34.7	26.4
1976	39.6	45.9	34.2	39.5	42.3	54.1	41.0	34.4	23.0
1977	38.8	40.4	37.4	38.5	41.5	52.2	43.0	24.0	27.5
1978	35.4	38.5	32.5	35.7	34.8	46.8	39.3	25.9	21.1
1979	35.8	37.7	34.0	35.6	36.7	47.1	41.9	23.8	22.1
1980	36.1	40.0	32.5	35.9	37.9	50.1	40.3	20.1	19.4
1983	36.9	36.9	37.0	36.8	38.7	49.1	45.5	16.2	22.9
1985	31.8	31.0	32.5	32.5	28.2	43.0	43.6	15.5	17.2
1987[a]	29.5	31.1	28.1	30.5	25.6	43.8	37.6	16.3	15.1
Trend information (1965–85)									
Change[b]/year	–0.69	–1.19	–0.28	–0.68	–0.79	–1.00	0.10	–1.51	–0.72
Standard error	0.09	0.10	0.12	0.09	0.17	0.13	0.10	0.13	0.15
R^2	0.86	0.94	0.40	0.85	0.71	0.87	NA[c]	0.95	0.75

[a]Provisional data only.
[b]In percentage points.
[c]The slope of the regression line was not significantly different from zero, making the R^2 computation inappropriate.

SOURCE: *NHISs 1965–87; unpublished data, Office on Smoking and Health.*

only from 40.5 percent in 1965 to 28.1 percent in 1987 at a rate of change (1965–85) one-quarter that of young males (–0.28 percentage points per year). The slower rate of decline among women is due, in large part, to the increase in initiation rates in less educated young women (Pierce, Fiore et al. 1989b).

Smoking initiation patterns among whites and blacks have been similar during the past 20 years. From 1965–87, smoking prevalence among whites aged 20 to 24 years has decreased from 47.5 percent to 30.5 percent, while for blacks the decline has been from 50.8 percent to 25.6 percent. The rates of change between 1965 and 1985 among whites and blacks were similar (–0.68 and –0.79 percentage points per year, respectively). The prevalence of smoking had been higher among young blacks than among young whites for most survey years between 1965 and 1983, but whites had a higher prevalence in 1985 and 1987.

Marked differences in smoking initiation rates based on educational level have occurred. From 1965–87, the smoking initiation rate as measured by prevalence, ages 20 to 24, fell among males with 12 or fewer years of schooling (high school graduate or less) from 63.6 percent to 43.8 percent (–1.00 percentage point per year from 1965–85). In contrast, for males with 13 or more years of schooling (some college or more), prevalence has fallen from 42.7 percent to 16.3 percent, at a rate of decline (1965–85) of 1.51 percentage points per year. A similar difference in initiation rates by education was seen among women, although the rate of decline between 1965 and 1985 was less among women than among men of equivalent education. In the overall sample (men and women combined), the rate of decrease in initiation among persons with 13 or more years of education (1.10 percentage points per year) was three times that among persons with 12 or fewer years of education (0.35).

Trends in Adolescent Smoking

Several surveys have provided national estimates of smoking prevalence among adolescents. Because these surveys differ in terms of the definitions of smoking, ages of respondents, sample size, method of data collection (household versus school versus telephone interview), years in which the surveys were conducted, and overall results, the findings of the major surveys are presented below.

NIDA High School Seniors Surveys on Drug Use, 1976–87

Data from the NIDA-sponsored High School Seniors Surveys have been collected annually since 1975 and are presented in Table 19. These surveys have been carried out by the University of Michigan Institute for Social Research (Johnston, O'Malley, Bachman 1987). This data set is most useful for examining trends in smoking. Individual prevalence figures probably underestimate actual adolescent smoking prevalence because the survey does not include high school dropouts, who are known to have much higher smoking rates (Pirie et al. 1988; Yates et al. 1988).

Reported daily smoking of cigarettes has decreased among high school seniors from a peak prevalence of 29 percent in 1976 to 19 percent in 1987. However, the trend has not been linear. The majority of the change occurred between 1978 and 1980, after

TABLE 19.—Smoking status (%) of high school seniors, United States, 1975–87

Year	Daily smokers	Less than daily smokers	Previous smokers, not in last month	Never smokers
1975	27	10	37	26
1976	29	10	36	25
1977	29	10	38	24
1978	28	9	38	25
1979	26	9	40	26
1980	21	9	41	29
1981	20	9	42	29
1982	21	9	40	30
1983	20	9	41	29
1984	18	11	41	30
1985	19	11	39	31
1986	18	11	38	32
1987	19	11	38	33

SOURCE: Institute for Social Research, University of Michigan (Bachman, Johnston, O'Malley 1980a,b, 1981, 1984, 1985, 1987; Johnston and Bachman 1980; Johnston, Bachman, O'Malley 1980a,b, 1982, 1984, 1986, and unpublished data, 1987).

which prevalence has remained relatively stable. The proportion of high school seniors who have smoked within the last month, although not on a daily basis, has not changed substantially during this period. There is also rather little change in the proportion of this population who has previously smoked but not in the last 30 days. The proportion of high school seniors who have never smoked increased from 26 percent to 33 percent between 1975 and 1987.

Trends in smoking status by sex, race, and educational plans are presented in Table 20. The prevalence of daily smoking decreased in all major subcategories of high school seniors between 1976 and 1987. Daily smoking among males decreased from a peak prevalence of 28 percent in 1976 to 16 percent in 1987; most of this drop occurred between 1977 and 1980. Daily smoking among females decreased from a peak prevalence of 30 percent in 1977 to 20 percent in 1987, with the largest decrease occurring from 1979–81. Since 1981, the prevalence of daily smoking among high school students has remained fairly constant for both males and females. In each year since 1977, the prevalence of daily smoking has been higher in females than in males (median difference=4 percentage points).

The prevalence of daily smoking fell substantially among blacks, from 26 percent in 1976 to 8 percent in 1987. During the same period, prevalence declined among whites from 29 percent to 20 percent. The reasons for the dramatic decline among blacks are unclear. It does not appear to be due to increasing sampling bias over time—survey methods and sample sizes by race have been consistent. A substantial decrease in smoking initiation among blacks also occurred, as measured in the NHIS by prevalence in persons 20 to 24 years of age, between 1983 (38.7 percent) and 1985 (28.2 percent) (Table 18). This figure declined further to a preliminary estimate of 25.6 percent in 1987.

Students with plans to pursue higher education were much less likely to be daily smokers in 1976 than those without such plans (21 percent versus 37 percent). The ab-

TABLE 20.—Smoking status (%) of high school seniors by sex, race, and educational plans, United States, 1975–87

	Daily smokers						Less than daily smokers					
	Sex		Race		Plans for higher education		Sex		Race		Plans for higher education	
Year	M	F	W	B	Yes	No	M	F	W	B	Yes	No
1975	27	26					10	10				
1976	28	28	29	26	21	37	10	10	10	13	10	10
1977	28	30	28	25	20	38	10	10	9	11	10	9
1978	26	29	27	22	18	36	9	10	9	9	9	9
1979	22	28	26	19	17	35	9	9	9	9	9	9
1980	18	24	22	16	14	31	8	10	9	10	9	10
1981	18	22	20	13	13	30	8	10	9	9	9	9
1982	18	24	23	12	13	30	9	9	9	9	9	9
1983	19	23	22	12	14	30	9	10	9	9	10	9
1984	16	21	20	8	11	29	10	11	11	9	11	11
1985	17	21	20	11	13	31	10	11	11	8	10	11
1986	17	20	21	8	12	29	11	11	12	7	11	10
1987	16	20	20	8	14	30	11	11	12	6	11	11

TABLE 20.—Continued

	Previous smokers, not in last month						Never smokers					
	Sex		Race		Plans for higher education		Sex		Race		Plans for higher education	
Year	M	F	W	B	Yes	No	M	F	W	B	Yes	No
1975	38	36					24	28				
1976	38	36	37	36	39	35	24	25	25	24	31	19
1977	39	35	37	49	41	35	24	25	25	26	30	19
1978	40	38	38	40	42	35	26	24	25	29	31	20
1979	42	38	39	41	42	37	27	25	26	30	32	20
1980	43	39	40	45	44	37	30	28	29	30	34	23
1981	43	41	41	45	45	38	31	27	29	33	33	24
1982	41	39	40	43	43	37	32	28	29	36	35	24
1983	41	40	40	45	43	38	31	28	29	34	34	24
1984	41	39	40	42	42	38	33	29	29	40	35	24
1985	39	39	38	42	41	36	33	30	30	39	36	24
1986	38	38	38	41	39	37	34	31	30	44	37	25
1987	38	38	38	41	39	35	35	31	30	45	37	25

SOURCE: Institute for Social Research, University of Michigan (See Table 19 for citations).

solute difference (in percentage points) between the two groups remained constant between 1976 and 1987. In 1987, the prevalence of daily smokers among those with plans for higher education was less than half the prevalence among those without such plans (14 percent versus 30 percent).

The percentage of blacks who smoke on less than a daily basis exceeded the percentage of whites in 1976 (13 and 10 percent, respectively) but was lower than the percentage of whites in 1987 (6 and 12 percent, respectively). The percentage who have previously smoked but not in the past month has consistently been slightly higher among blacks than among whites and among those with plans for higher education than among those without college plans. Besides these findings, there have been few differences between subgroups and few changes between 1976 and 1987 in the proportion of high school seniors who are in these categories.

As mentioned above, the decrease in the proportion of high school seniors who smoke on a daily basis is reflected by a complementary increase in the proportion of high school seniors who have never smoked. This increase has been more marked among males compared with females and among blacks compared with whites.

1987 National Adolescent Student Health Survey

The 1987 NASHS collected data on prevalence of smoking within the last 30 days (US DHHS, in press,b). Respondents to this survey composed a random sample of the Nation's students in 8th and 10th grades. Sixty-three percent of the 8th graders were 13 years old and 27 percent were 14 years old. Sixty-two percent of the 10th graders were 15 years old and 28 percent were 16 years old. For each grade, 68 percent were white, 17 percent were black, and 9 percent were Hispanic.

Prevalence data are presented in Table 21. Eighty-four percent of the eighth graders reported that they had not even puffed on a cigarette in the last 30 days, with little difference between the sexes. Forty-nine percent of all eighth graders reported never having smoked a cigarette, with no difference between the sexes. Among 10th graders, the proportion not having puffed on a cigarette in the last 30 days was slightly lower: 76 percent among males and 71 percent among females. Thirty-eight percent of males and 36 percent of females in this grade reported that they had never had a cigarette.

TABLE 21.—30-day prevalence of smoking (%), United States, 1987, 8th and 10th grades

	8th grade		10th grade	
	Males	Females	Males	Females
Not even a puff	84.9	83.0	75.9	71.3
1–4 cigarettes	7.1	8.2	7.8	10.4
5–19 cigarettes	2.7	3.4	4.8	5.1
1–5 packs	2.4	3.5	5.6	7.4
More than 5 packs	2.9	1.9	6.0	5.8

SOURCE: National Adolescent Student Health Survey 1987 (US DHHS, in press, b).

Approximately equal proportions (7 to 8 percent) of males and females in the eighth grade reported smoking a pack or more in the last month. Among 10th graders, this proportion was more than twice as high, with 17 percent of males and 19 percent of females reporting that they smoked a pack or more in the last month.

US DHEW Teenage Smoking Surveys, 1968–79

Detailed questions on smoking were asked in five national telephone surveys of adolescents (ages 12 to 18 years) conducted by Chilton Research Services for the U.S. Department of Health, Education, and Welfare from 1968 through 1979 (US DHEW 1979b). Adolescents were classified by smoking status as follows: *never smokers*, had not taken even a few puffs of a cigarette; *experimental smokers*, had had a few puffs but had not smoked as many as 100 cigarettes; *ex-smokers*, had smoked at least 100 cigarettes but no longer smoked; *current occasional smokers*, smoked less than one cigarette per week; and *current regular smokers*, smoked at least one cigarette per week. In published results for these surveys, data for never smokers and experimental smokers were generally aggregated.

Summary data from each of the surveys are presented in Table 22 (males) and Table 23 (females). The proportion of both males and females of each age group who are classified as either never smokers or experimental smokers is substantially higher than the proportion of never smokers reported by other surveys. For example, the 1979 Teenage Smoking Survey showed that 75 percent of males and 82 percent of females aged 15 to 16 years had never smoked or had only experimented with cigarettes; in contrast, the 1987 NASHS (above) showed that only 38 percent of males and 36 percent of females in the 10th grade (15 to 16 years old) had never had a cigarette. Similarly, the 1979 Teenage Smoking Survey showed that 68 percent of males and 64 percent of females aged 17 to 18 years were either never smokers or experimental smokers; in contrast, the 1979 High School Seniors Survey showed that 27 percent of males and 25 percent of females were never smokers.

There are at least two possible explanations for the consistently and surprisingly high proportion of teenagers in the categories of never smokers and experimental smokers. First, 100 cigarettes may be too high a cutoff to use for classifying teenagers as never smokers or experimenters. Second, telephone interviewing may lead to more underreporting of cigarette smoking behavior than other survey modalities. Underreporting may be more important for some smoking categories than others—for instance, occasional smokers might be particularly sensitive about their smoking behavior and might be more likely to underreport the total number of cigarettes they have ever smoked.

Current smoking rates can also be compared between the Teenage Smoking Surveys and the High School Seniors Surveys. In the 1979 telephone survey, teenagers were classified on their reported smoking on a weekly basis. Of males aged 17 to 18 years, 19.3 percent were classified as current regular smokers (one or more cigarettes per week) and another 0.3 percent were classified as current occasional smokers (less than one cigarette per week). For females aged 17 to 18 years, these figures were 26.2 percent and 0.8 percent, respectively. In the High School Seniors Survey, students are

TABLE 22.—Cigarette smoking among teenage males, United States, 1968–79

Smoking status	Year	Age							
		12–14 years		15–16 years		17–18 years		Total	
		N	%	N	%	N	%	N	%
Never smoked or	1968	876	93.1	465	75.2	344	54.7	1,685	77.0
experimented only	1970	512	90.5	268	70.5	178	48.1	958	72.8
	1972	533	91.1	273	68.3	211	54.4	1,017	74.1
	1974	496	90.7	253	69.5	202	55.3	951	74.5
	1979	527	92.8	284	75.3	254	68.1	1,065	80.8
Former smoker	1968	25	2.7	34	5.5	71	11.3	130	5.9
	1970	21	3.7	35	9.2	52	14.1	108	8.2
	1972	20	3.4	50	12.5	56	14.4	126	9.2
	1974	28	5.1	45	12.4	44	12.1	117	9.2
	1979	23	4.0	38	10.1	46	12.3	107	8.1
Current occasional	1968	13	1.4	14	2.3	24	3.8	51	2.3
smoker	1970	1	0.2	3	0.8	2	0.5	6	0.5
	1972	5	0.9	6	1.5	4	1.0	15	1.1
	1974	0	0.0	0	0.0	6	1.6	6	0.5
	1979	0	0.0	4	1.1	1	0.3	5	0.4

TABLE 22.—Continued

Smoking status	Year	Age							
		12–14 years		15–16 years		17–18 years		Total	
		N	%	N	%	N	%	N	%
Current regular	1968	27	2.9	105	17.0	190	30.2	322	14.7
smoker	1970	32	5.7	74	19.5	138	37.3	244	18.5
	1972	27	4.6	71	17.8	117	30.2	215	15.7
	1974	23	4.2	66	18.1	113	31.0	202	15.8
	1979	18	3.2	51	13.5	72	19.3	141	10.7
Total	1968	941	100	618	100	629	100	2,188	100
	1970	566	100	380	100	370	100	1,316	100
	1972	585	100	400	100	388	100	1,373	100
	1974	547	100	364	100	365	100	1,276	100
	1979	568	100	377	100	373	100	1,318	100

SOURCE: US DHEW Teenage Smoking Surveys, 1968, 1970, 1972, 1974, 1979 (US DHEW 1979b).

TABLE 23.—Cigarette smoking among teenage females, United States, 1968–79

Smoking status	Year	Age							
		12–14 years		15–16 years		17–18 years		Total	
		N	%	N	%	N	%	N	%
Never smoked or experimented only	1968	919	97.9	552	84.4	462	73.0	1,933	86.8
	1970	536	95.0	312	81.5	264	70.0	1,112	84.0
	1972	569	95.3	312	77.0	277	66.7	1,158	81.7
	1974	495	90.2	250	69.3	228	62.1	973	76.2
	1979	514	92.3	319	81.8	239	63.9	1,072	81.2
Former smoker	1968	7	0.7	25	3.8	38	6.0	70	3.1
	1970	8	1.4	15	3.9	22	5.8	45	3.4
	1972	11	1.8	26	6.4	30	7.2	67	4.7
	1974	26	4.7	33	9.1	42	11.4	101	7.9
	1979	19	3.4	23	5.9	34	9.1	76	5.8
Current occasional smoker	1968	7	0.7	14	2.1	15	2.4	36	1.6
	1970	3	0.5	1	0.3	5	1.3	9	0.7
	1972	0	0.0	1	0.2	3	0.7	4	0.3
	1974	1	0.2	5	1.4	2	0.5	8	0.6
	1979	0	0.0	2	0.5	3	0.8	5	0.4

TABLE 23.—Continued

Smoking status	Year	Age							
		12–14 years		15–16 years		17–18 years		Total	
		N	%	N	%	N	%	N	%
Current regular	1968	6	0.6	63	9.6	118	18.6	187	8.4
smoker	1970	17	3.0	55	14.4	86	22.8	158	11.9
	1972	17	2.8	66	16.3	105	25.3	188	13.3
	1974	27	4.9	73	20.2	95	25.9	195	15.3
	1979	24	4.3	46	11.8	98	26.2	168	12.7
Total	1968	939	100	654	100	633	100	2,226	100
	1970	564	100	383	100	377	100	1,324	100
	1972	597	100	405	100	415	100	1,417	100
	1974	549	100	361	100	367	100	1,277	100
	1979	557	100	390	100	374	100	1,321	100

SOURCE: US DHEW Teenage Smoking Surveys, 1968, 1970, 1972, 1974, 1979 (US DHEW 1979b).

classified based on their reported smoking during the past 30 days. In the 1979 High School Seniors Survey (Table 22), 22 percent of males were classified as daily smokers and another 9 percent reported having smoked in the last month but not on a daily basis. In the same year, 29 percent of females were daily smokers and 9 percent smoked on less than a daily basis.

Comparing these two data sets shows that the telephone survey obtained lower estimates for *weekly* smoking than the school survey obtained for *daily* smoking (19 vs. 22 percent for males, 26 vs. 28 percent for females). The remaining current smokers (defined as less than one cigarette per week in the telephone survey and less than one per day in the school survey) were also estimated at lower rates in the telephone survey (0.3 vs. 9 percent for males, 0.8 vs. 9 percent for females). This suggests that the telephone survey underestimated both the number of daily smokers and the number of less-than-daily smokers. Most of the discrepancy appears to be due to a failure to identify the latter. It is unclear whether this difference is related to the system of classifying smokers or the telephone survey methodology.

NIDA National Household Surveys on Drug Abuse, 1979–85

NIDA conducted household surveys on drug abuse in 1979, 1982, and 1985. For each of these surveys, data were obtained from a stratified random sample of 8,000 U.S. households; approximately 2,000 in-person interviews were conducted with respondents in the 12- to 17-year-old age group. Questions included whether any cigarettes were smoked within 30 days as well as within the previous year. These surveys indicated that approximately 26 percent of the teenage population surveyed smoked at least one cigarette at some time during 1985 (Table 24). In 1985, 15.6 percent of this population had smoked within the previous month. Comparisons between data from the 1979 household survey and data from the more recent surveys are not appropriate, because in 1979 prevalence of use within the past year or past month was reported only for those who had smoked 100 cigarettes in their lifetime; this lifetime cutoff was not used in the later surveys.

TABLE 24.—Prevalence (%) of cigarette use among youth 12 to 17 years of age, 1979, 1982, and 1985, United States

Survey year	Any use in last year	Used in last 30 days
1979[a]	13.3	12.1
1982	24.8	14.7
1985	26.0	15.6

[a]The 1979 estimates are not necessarily comparable to later estimates because the 1979 survey asked questions only of those who had smoked 100 cigarettes in their lifetime.

SOURCE: NIDA National Household Surveys on Drug Abuse 1979, 1982, 1985 (US DHHS 1988).

Summary

Several national surveys provide information on adolescent smoking. These surveys vary substantially in sample size, methodology, definitions of smoking, ages of respondents, and other factors that may appreciably affect prevalence estimates.

The best trend data are available from the annual high school seniors survey. This survey shows that prevalence of daily cigarette consumption declined from 29 percent of seniors in 1976 to 21 percent in 1980, after which prevalence leveled off at 18 to 21 percent. Smoking prevalence among females has consistently exceeded that among males since 1977. The leveling off of smoking prevalence among high school seniors raises concern that the steadily declining initiation rates as determined by prevalence among adults aged 20 to 24 (NHIS) may soon level off as well.

Smoking prevalence has been consistently lower for high school seniors with plans to pursue higher education than for those without such plans. In 1987, smoking rates were 14 and 30 percent in these two groups, respectively.

Differences in prevalence of smoking and smokeless tobacco use (see below) between young males and young females suggest that the prevalence of any tobacco use is similar in these two groups. Whereas the prevalence of smoking is higher among female high school seniors than among males, the prevalence of smokeless tobacco use is higher among young males than among young females.

Changes in the Types of Cigarettes Smoked

Data on the market share of filter and nonfilter cigarettes, cigarettes of different machine-determined "tar" and nicotine yields, menthol and nonmenthol cigarettes, and cigarettes of different length have been published by the Federal Trade Commission (FTC) from information supplied to the agency by the major cigarette companies.

Filtered Cigarettes

Filters are the design characteristic of commercial cigarettes that most affects their machine-measured yield of harmful constituents (US DHHS 1981). Filters selectively remove nitrosamines and semivolatile phenols from smoke. Thus, filters affect not only the absolute amounts of these constituents delivered in smoke but also their relative concentrations in cigarette "tar."

Since the early 1950s, the proportion of cigarettes in the United States sold as filtered cigarettes has increased steadily. In 1950, less than 1 percent of cigarettes sold in the United States were filtered. That proportion rose to 19 percent in 1955, 51 percent in 1960, and 94 percent in 1986 (Table 25).

Low-Tar, Low-Nicotine Cigarettes

Trends in the sales-weighted average yield of tar and nicotine for cigarettes sold in the United States are shown in Figure 14 of Chapter 2. The sales-weighted average is based on the tar and nicotine yield of specific brands (as measured by the FTC machine-

TABLE 25.—Domestic market share of filter cigarettes as a proportion of total cigarettes sold, United States, 1950–86

Year	Market share (%)	Year	Market share (%)
1950	0.6	1969	77
1951	0.7	1970	80
1952	1	1971	82
1953	3	1972	84
1954	9	1973	85
1955	19	1974	86
1956	28	1975	87
1957	38	1976	88
1958	45	1977	90
1959	49	1978	90
1960	51	1979	91
1961	52	1980	92
1962	55	1981	92
1963	58	1982	93
1964	61	1983	93
1965	64	1984	93
1966	68	1985	94
1967	72	1986	94
1968	74		

SOURCE: FTC (1988).

testing method) multiplied by the quantity of sales for those brands. The sales-weighted average yield of tar fell from 35 mg in 1957 to 13 mg in 1987. For nicotine, the sales-weighted average fell from 1.3 mg in 1968 to 1.0 mg in 1985. However, the sales-weighted average yield of tar and nicotine leveled off between 1981 and 1987. As pointed out in Chapter 2, modifications in the makeup of commercial cigarettes have profoundly influenced these yields; for example, the steepest declines occurred in the late 1950s after introduction of filter tips.

Trends in the percentage of domestic sales of cigarettes yielding lower tar levels are shown in Table 26. The domestic market share of cigarettes yielding 15 mg or less tar increased from 2.0 percent in 1967 to 56.0 percent in 1981. Since 1981, this proportion has fallen slightly and has stabilized at 51 to 53 percent. About two-thirds of these cigarettes have tar yields between 9 and 15 mg.

It should be noted that the parameters used in the FTC machine-testing method (developed in the 1960s) do not necessarily reflect current smoking patterns. For example, the FTC method uses one puff per minute (Pillsbury et al. 1969), whereas human

TABLE 26.—Domestic market share of cigarettes with reduced tar, percentage of total cigarettes sold, United States, 1967–86

	Tar Yield				
Year	≤15 mg	≤12 mg	≤9 mg	≤6 mg	≤3 mg
1967	2.0				
1968	2.5				
1969	3.0				
1970	3.6				
1971	3.8				
1972	6.6				
1973	8.9				
1974	8.9				
1975	13.5				
1976	15.9				
1977	22.7				
1978	27.5				
1979	40.9		10.6	5.8	2.7
1980	44.8		16.8	7.3	3.3
1981	56.0		24.6	9.6	3.7
1982	52.2	43.8	27.8	8.9	2.9
1983	53.1	44.9	27.9	9.4	3.1
1984	51.0	43.4	26.3	9.4	2.9
1985	51.9	43.1	25.3	8.4	2.3
1986	52.6	44.5	22.3	9.9	2.6

SOURCE: FTC (1988); Kozlowski (1989).

studies of smoking patterns show an average interpuff interval of 34 seconds (that is, about two puffs per minute) (US DHHS 1988, Chapter 4, Table 2).

According to the 1986 AUTS, 41 percent of smokers smoke cigarettes yielding 15 mg or less tar (Table 27). The proportion of smokers smoking cigarettes yielding more than 15 mg tar is higher among males, blacks, and persons with less education compared with females, whites, and more educated persons, respectively. This proportion decreases with age; the higher proportion among those 17 to 19 years of age probably reflects the popularity of the higher tar Marlboro brand among adolescents (Hunter et al. 1986; Goldstein et al. 1987; Glantz 1985).

Increased consumer demand for lower yield cigarettes during the past two decades is probably attributed to consumer beliefs that lower yield brands are less hazardous. This impression may have resulted in part from cigarette advertising implying that low-yield brands are less hazardous or are safe (Davis 1987). According to the 1986 AUTS, 45 percent of current smokers believe that some kinds of cigarettes are probably more hazardous than others (see Chapter 4).

TABLE 27.—Percentage of current smokers, aged 17 years and older, who use cigarettes of varying tar yields and who use menthol cigarettes, by sex, race, and education, 1986

	Percentage of current smokers				
	Tar yield (mg/cigarette)				Menthol cigarette smokers
	≤10	>10–15	>15	Total	
Total	29.6	11.6	58.8	100	29.2
Sex					
Males	26.8	8.0	65.2	100	29.9
Females	32.7	15.6	51.7	100	34.0
Age					
17–19	31.7	2.7	65.6	100	29.3
20–24	30.4	4.9	64.8	100	24.1
25–44	31.5	8.8	59.7	100	34.4
45–64	26.3	17.8	55.9	100	23.7
≥65	26.3	22.6	51.1	100	21.1
Race					
White	31.8	12.3	55.9	100	23.1
Black	14.5	7.6	78.0	100	75.5
Other	26.2	5.3	68.5	100	24.9
Education					
≤11 years	23.5	11.6	64.8	100	27.6
12 years	29.4	11.9	58.7	100	29.7
13–15 years	36.8	9.7	53.5	100	32.0
≥16 years	36.4	13.2	50.4	100	27.1

SOURCE: Self-reported data on cigarette brand use, AUTS 1986 (US DHHS, in press, a). Sample sizes for each stratum are shown in Table 34.

The 1981 Surgeon General's Report (US DHHS 1981) concluded that although smoking lower yield cigarettes appears to reduce the risk of lung cancer, the benefits are minimal compared with giving up cigarettes entirely. Moreover, there is no definitive evidence that smoking lower yield cigarettes is associated with reduced risks of other cancers, cardiovascular disease, and fetal damage. Switching to low-yield brands may even increase the health risk for smokers who compensate for reduced nicotine intake by increasing the number of cigarettes smoked per day, the frequency of puffing, and the depth and duration of inhalation (US DHHS 1988).

The leveling off of sales-weighted tar and nicotine yields may be related to one or a combination of the following factors (US DHHS 1988): (1) a persistent brand loyalty of some smokers to moderate- or high-yield brands because of brand image; (2) a diminishing perception that low-yield brands are less hazardous (see Chapter 4); and (3) a tendency of some smokers to smoke cigarettes of such low tar and nicotine yields that further reductions in those yields may be unacceptable; that is, the "lower boundary" of comfortable cigarette use has been reached (Kozlowski 1987, 1989).

Menthol Cigarettes

From 1963–76, the domestic market share of menthol cigarettes increased gradually from 16 percent to 28 percent. Since 1976, this proportion has remained at 28 percent (FTC 1988). According to the 1986 AUTS, 29 percent of current smokers smoke menthol cigarettes. Seventy-six percent of black smokers smoke menthol cigarettes compared with 23 percent of whites (Table 27). Similar findings were reported by Cummings and colleagues (1987).

Menthol in cigarettes provides a sensation of cooling, which may promote deeper, prolonged inhalation of cigarette smoke. This may help to explain why blacks (who are much more likely to smoke menthol cigarettes) have higher mortality rates from certain smoking-related diseases (e.g., lung cancer, heart disease, and cerebrovascular disease) than whites despite smoking fewer cigarettes per day (Novotny, Warner et al. 1988). Increased lung cancer mortality rates among blacks may also relate to increased occupational or environmental exposures among blacks that promote the carcinogenic effects of smoking, or to the fact that blacks are more likely to smoke higher tar brands (Table 27), which are associated with higher lung cancer mortality rates (US DHHS 1981). There does not appear to be a positive correlation between the presence of menthol and higher tar yields in cigarette brands: in the FTC's 1985 list of 207 brands (FTC 1985), 67 percent (51/76) of menthol brands had tar yields of less than 13 mg, compared with 56 percent (73/131) of nonmenthol brands.

Cigarette Length

From 1967–86, the domestic market share of cigarettes 68 to 88 mm in length decreased from 91 percent to 60 percent. During the same time, the domestic market share of cigarettes 94 to 101 mm in length increased from 9 to 37 percent (Table 28).

Because of the dose–response relationship between smoking and risk of disease (see Chapter 2), this increase in the average length of cigarettes has potentially important public health implications. However, smokers tend to compensate for changes in cigarette length by changing the number of cigarettes smoked per day, puffing frequency, and other measures of smoking behavior so as to minimize the change in overall nicotine intake (US DHHS 1988).

TABLE 28.—Domestic market share of cigarettes (%), by cigarette length, percentage of total cigarettes sold, United States, 1967–86

Year	68–72 mm	79–88 mm	94–101 mm	110–121 mm
1967	14	77	9	
1968	12	74	13	
1969	11	74	16	
1970	9	73	18	
1971	8	72	20	
1972	8	71	21	
1973	7	71	22	
1974	6	71	23[a]	
1975	6	69	24	1
1976	5	69	24	2
1977	5	67	26	2
1978	5	65	27	2
1979	4	65	30	2
1980	3	63	32	2
1981	3	62	33	2
1982	3	61	34	2
1983	3	60	34	2
1984	3	59	36	2
1985	3	58	37	2
1986	2	58	37	3

NOTE: Because of rounding, the total of the individual percentages may not equal 100 percent in some instances.

[a]The 110- to 121-mm length was combined with the 94- to 101-mm length.

SOURCE: FTC (1988).

Summary and Comment

During the past 40 years, filtered cigarettes have virtually replaced nonfiltered cigarettes in the United States. The domestic market shares of lower (15 mg or less) tar cigarettes and menthol cigarettes have increased during the past two decades but have leveled off in recent years. The domestic market share of longer (94–101 mm) cigarettes has increased substantially since the mid-1960s and still appears to be rising slowly.

Continued health concerns among smokers are likely to encourage the cigarette industry to continue to design new cigarettes that are perceived as less hazardous. Besides filtered, low-yield cigarettes, other "high-tech" cigarettes have been marketed that may appear to smokers to be less hazardous. These include one brand with a recessed filter and another with a "flavor-control filter" that apparently allows the smoker to regulate the tar yield of individual cigarettes (Davis 1987). The R.J. Reynolds Tobacco Company announced in September 1987 plans to market a new product that heats rather than burns tobacco. R.J. Reynolds asserts that the product is a cigarette, and it

has commonly been referred to in the press as a "smokeless cigarette." In a press release, the company's chief executive officer stated that "a majority of the compounds produced by burning tobacco are eliminated or greatly reduced, including most compounds that are often associated with the smoking and health controversy" (R.J. Reynolds 1987). The American Medical Association (1988) and the Coalition on Smoking OR Health (1988) have filed petitions with the U.S. Food and Drug Administration (FDA) seeking FDA regulation of this new product as a drug or medical device based on implicit health claims, among other reasons. As of November 1988, these petitions were under review by the FDA. In October 1988, R.J. Reynolds began test marketing the product, named Premier, in three cities (Phoenix and Tucson, AZ, and St. Louis, MO). (See Chapter 7.)

Other Types of Tobacco Use

Smokeless Tobacco Use

Smokeless tobacco (ST) use, including snuff and chewing tobacco, became a subject of concern in the United States during the 1980s (US DHHS 1986). Cross-sectional national surveys and various regional surveys have identified several demographic categories at high risk for the use of these products, including young white males, persons living in the Southern and North Central United States, American Indians, and Alaskan Natives (Rouse, in press; Boyd et al. 1987; CDC 1987c, 1988; Schinke et al. 1986). Trend data on ST use are available primarily through the AUTSs, which included persons aged 21 years or older in 1964, 1966, 1970, and 1975 (US DHEW 1969, 1973a, 1976), and persons aged 17 years and older in 1986 (Novotny, Pierce et al., in press). In addition, the 1970 and 1987 NHISs included data on ST use among persons aged 17 years and older and aged 18 years and older, respectively. The Behavioral Risk Factor Surveillance System of the Centers for Disease Control collected State-specific data on ST use among persons aged 18 years and older beginning in 1986 (CDC 1987d). The 1985 CPS of the U.S. Bureau of the Census included questions about ST use among persons aged 17 years and older (Marcus et al., in press). This survey also produced State-specific estimates for prevalence of use of these products. Definitions of ST use and questions asked about ST use in these surveys are listed in the Appendix to this Chapter.

Figure 5 compares age-specific data for men from the 1970 NHIS and the 1986 AUTS. Between 1970 and 1986, snuff use increased fifteenfold and chewing tobacco use more than fourfold among males aged 17 to 19 years. Smaller increases were observed among the middle-aged groups, and a decrease in the use of both products was noted for older men (age 50 and above). The NHIS used household interviews, and the AUTS used telephone interviews as their primary mode of data collection; however, this difference in methodology is unlikely to account for the substantial increase in ST use among teenage males.

Data on ST use among persons aged 21 years or older are presented below from the 1964–86 AUTSs. These surveys were based on in-person interviews in 1964 and 1966 and telephone interviews in 1970, 1975, and 1986. State-specific data from the 1985

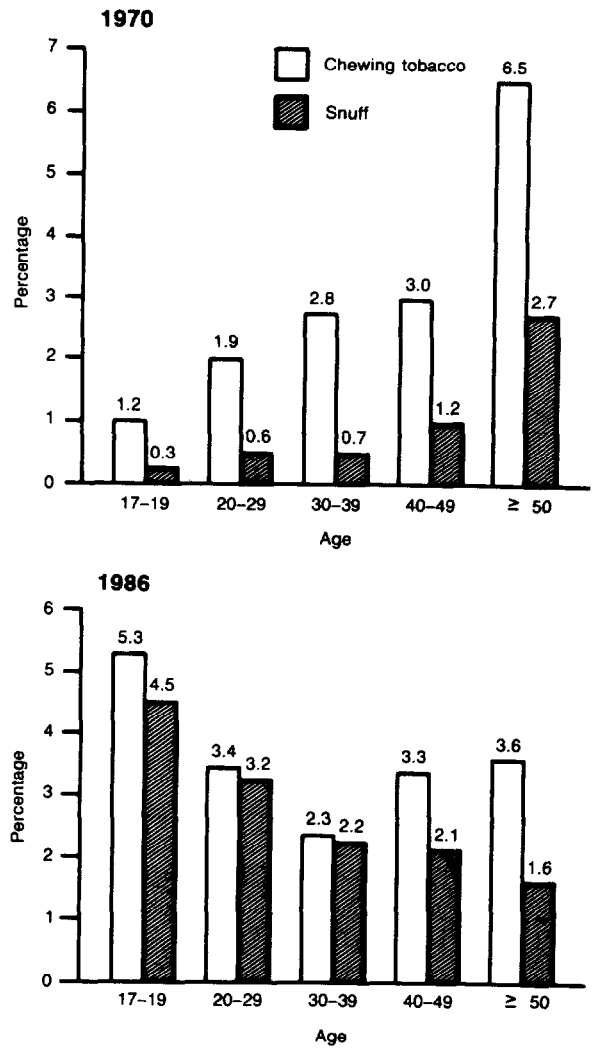

FIGURE 5.—Prevalence of chewing tobacco and snuff use among men, 1970 (NHIS) and 1986 (AUTS)

SOURCE: US DHHS (1986a); Novotny, Pierce et al., in press.

CPS are reported. Finally, data from a more detailed analysis of ST use from the 1986 AUTS for men aged 17 years and older (Novotny, Pierce et al., in press) are described.

The prevalence of current ST use from 1964–86 among persons aged 21 years and older, stratified by product and sex, is shown in Figure 6. For both products, there has been a steady overall decline in use by both men and women. It is possible that this decline is due in part to the change in the AUTS interview technique from in-person

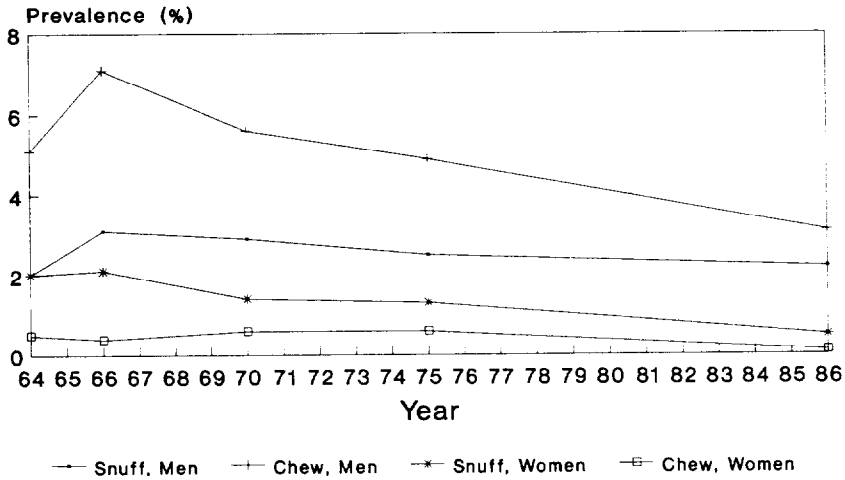

FIGURE 6.—Smokeless tobacco use among adults 21 years of age and older, United States, 1964–86

SOURCE: AUTSs (Novotny, Pierce et al., in press).

interview (1964 and 1966) to telephone interview (1970, 1975, 1986); telephone surveys generally provide slightly lower smoking prevalence estimates than in-person surveys (see above). The prevalence of ST use among women has consistently been very low. However, the use of snuff by older black women in the South is much more common than among women in the general population (Rouse, in press).

In 1986, the weighted prevalence of snuff use was 2.2 percent for men and 0.5 percent for women, and of chewing tobacco use, 3.1 percent for men and 0.1 percent for women among adults aged 21 years and older. For 1986, overall prevalence of ever and current use of ST among males, aged 17 years and older, is shown in Table 29. More than 10 percent of male respondents had ever used ST products; chewing tobac-

TABLE 29.—Prevalence (%) of ever use and current use of smokeless tobacco, males aged 17 years and older, United States, 1986

Product used	Ever use	Current use
Any smokeless tobacco	12.6	5.2
Snuff[a]	5.8	2.4
Chewing tobacco[b]	9.9	3.3
Both	3.1	0.5

[a]Includes those who also use chewing tobacco.

[b]Includes those who also use snuff.

SOURCE: AUTS 1986 (Novotny, Pierce et al., in press).

co appears to be used slightly more commonly than snuff. Few men (0.5 percent) use both products.

The prevalence of ever use and current use of any ST product by males, stratified by selected sociodemographic variables, is shown in Table 30. The prevalence of both current and ever use was highest among younger men, whites, men living in the Southeast, less educated men, men below the poverty level, unemployed men, and lower income men. Among males 17 to 19 years of age, 8.2 percent were current ST users. In a multivariate model using the sociodemographic variables as predictors of ST use (Table 31), white men were more than twice as likely to use ST as black men; men employed in blue-collar or service/laborer jobs or who were unemployed were 3 times more likely to use ST than white-collar workers; and men in the Southeast and West were more likely to use ST than men in other regions.

Two-thirds of men who ever used ST began use before age 21; more than one-third began before age 16 (Table 32). The median age of initiation of ST use for both snuff and chewing tobacco is 19 years (Novotny, Pierce et al., in press).

The State- and region-specific prevalence of current snuff and chewing tobacco use among men aged 16 years and older is shown in Table 33. These data are from the 1985 CPS. As mentioned earlier, 45 percent of interviews in the CPS were with proxy respondents. Proxy responses are known to affect the accuracy of information on smoking behavior, especially daily cigarette consumption (see above). The effect of proxy responses on data relating to ST use is unknown.

Overall prevalence for males in the 1985 CPS was 1.9 percent for snuff and 3.9 percent for chewing tobacco. Use of ST was lowest in the Northeast and highest in the South, with intermediate values reported for the North Central and Western regions. Among women, the overall prevalence of snuff use was only 0.5 percent, with all regions having prevalence rates of 0.5 percent or less except the South (1.4 percent). Prevalence of chewing tobacco use among women was 0.2 percent overall.

In summary, ST use is increasing among adolescent males and is decreasing slightly overall among men aged 21 years and older in the United States. It continues to be a rare behavior among women. According to national surveys, sociodemographic correlates of use include blue-collar and service/laborer employment, unemployment, and residence in the South. Local surveys have also shown high usage rates among American Indian youth (CDC 1987c, 1988; Schinke et al. 1987; Hall and Dexter 1988). Because ST use is more common among young males than among young females, while the prevalence of smoking among high school seniors is higher among females than among males (see above), the prevalence of any tobacco use may be similar among young males and young females.

Cigar and Pipe Smoking

Table 34 presents data from the 1986 AUTS for cigar and pipe smoking. Cigar and/or pipe smoking mainly occurs among men, in whom prevalence of use is 8.7 percent. The highest proportion of users are between the ages of 45 and 64 years. Usage is slightly higher in the most and least educated groups than in the intermediate education categories.

TABLE 30.—Prevalence (%) of smokeless tobacco use by sociodemographic categories, males aged 17 years and older, United States, 1986

Category	Ever use	Current use
Age group		
17–19	12.3	8.2
20–29	11.4	5.9
30–39	7.3	4.1
40–49	9.7	5.0
≥50	11.5	4.8
Race		
White	11.1	5.6
Black	6.6	3.0
Other	7.7	2.9
Geographic area		
Southeast	14.5	7.5
West	9.6	4.5
Midwest	9.5	4.3
Northeast	5.5	3.0
Completed years of school		
≤11	14.6	7.3
12	11.1	5.6
13–15	9.1	3.8
≥16	4.8	2.9
Poverty level		
Below	16.1	8.5
Above	9.9	4.9
Employment		
Unemployed	13.0	8.3
Service/laborer	12.3	6.4
Blue collar	7.0	3.6
White collar	2.3	1.0
Household income (dollars per year)		
<10,000	16.1	8.6
10,000–29,999	4.7	2.2
≥30,000	3.0	1.6

SOURCE: AUTS 1986 (Novotny, Pierce et al., in press).

TABLE 31.—Significant sociodemographic correlates of current use of any smokeless tobacco, males aged 17 years and older, United States, 1986

Parameter	Odds ratio	95% confidence limits
Region		
Southeast	3.0	1.8, 4.8
West	1.9	1.1, 3.3
Midwest	1.4	0.8, 2.5
Northeast	Referent	
Race		
White	2.4	1.3, 4.3
Black	Referent	
Employment		
Unemployed	3.8	1.9, 7.6
Service/laborer	2.9	1.8, 4.6
Blue collar	3.0	2.1, 4.3
White collar	Referent	

SOURCE: AUTS 1986 (Novotny, Pierce et al., in press).

TABLE 32.—Reported age of initiation and median age of initiation of smokeless tobacco use among ever users, males aged 17 years and older, United States, 1986

	Age group at initiation (percentage reporting)				
Product	<16	16–18	19–20	≥21	Median
Any smokeless tobacco	37.1	7.8	21.4	33.8	19
Snuff[a]	35.5	8.6	23.0	32.8	19
Chewing tobacco[b]	36.6	6.7	20.3	36.3	19

[a]Includes those who also use chewing tobacco.
[b]Includes those who also use snuff.
SOURCE: AUTS 1986 (Novotny, Pierce et al., in press).

TABLE 33.—Prevalence (%) of current use of snuff and chewing tobacco by region, division, and State, males aged 16 years and older, United States, 1985

	Snuff use	Chewing tobacco use	Any smokeless tobacco use
United States	1.9	3.9	5.5
Northeast Region	1.0	1.4	2.3
New England Division	0.4	0.8	1.2
Maine	0.9	1.5	2.3
New Hampshire	1.2	1.5	2.7
Vermont	0.9	4.7	5.5
Massachusetts	0.2	0.4	0.5
Rhode Island	0.5	0.6	0.9
Connecticut	0.3	0.5	0.8
Mid-Atlantic Division	1.2	1.6	2.7
New York	0.5	1.2	1.6
New Jersey	0.1	0.6	0.7
Pennsylvania	3.0	2.9	5.6
North Central Region	2.1	3.4	5.3
East North Central Division	1.8	2.9	4.4
Ohio	2.2	3.2	5.0
Indiana	2.6	3.2	5.6
Illinois	1.1	2.5	3.3
Michigan	0.8	2.7	3.4
Wisconsin	2.9	2.9	5.8
West North Central Division	2.9	4.7	7.5
Minnesota	3.5	2.8	6.1
Iowa	1.8	4.6	6.4
Missouri	3.1	3.6	6.7
North Dakota	6.1	5.1	10.7
South Dakota	1.9	6.1	7.9
Nebraska	1.4	6.8	8.0
Kansas	3.3	8.6	11.7
South Region	2.7	6.0	8.3
South Atlantic Division	1.8	5.2	6.7
Delaware	0.6	2.4	3.0
Maryland	0.4	2.1	2.4
District of Columbia	0.0	0.4	0.4
Virginia	2.3	6.2	7.8
West Virginia	11.5	13.5	23.1
North Carolina	1.8	8.6	9.8